

Technical Program Contents

Session A

Ziegfeld Room: Opening Ceremony

8:30 a.m. – 10:00 a.m.

Tuesday, June 9, 1987

Welcome

Mr. Steve March
Dr. Dave McQuiddy
Dr. Rey Kagiwada

Keynote Address

Mr. Les Besser

Session B

Ziegfeld Room: Joint with Monolithics Symposium

– Non-Linear and Power Circuits

10:30 a.m. to Noon

Tuesday, June 9, 1987

Chairman: D.R. Chen, Microwave Monolithics, Inc.

Co-Chairman: Z.J. Lemnios, Ford Microelectronics, Inc.

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| B-1 | Nonlinear Modeling for MMICs (Invited) | 85 |
| 10:30 a.m. | Don Estreich
Hewlett-Packard, Microwave Technology Division,
Santa Rosa, CA | |
| B-2 | Ka-Band Monolithic GaAs Power FET Amplifiers | 89 |
| 11:00 a.m. | H.L. Hung, A. Ezzeddine, L. Holdeman, F. Phellips, J. Allison,
A. Cornfeld, T. Smith, and H. Huang
Comsat Laboratories, Clarksburg, MD. | |
| B-3 | Wideband GaAs MMIC Receiver | 93 |
| 11:20 a.m. | D.C. Yang, R. Estandiari, T.S. Lin and T. O'Neill
TRW Inc., Microwave and Millimeter-Wave Technology Center
Redondo Beach, CA | |
| B-4 | 1-6 GHz GaAs MMIC Linear Attenuator with Integral Drivers | 97 |
| 11:40 a.m. | T. Andrade, G. Lazama, R. Benton
Pacific Monolithics, Inc.
Sunnyvale CA | |

Session C

Gable 5, 6, 7 Room: Computer-Aided Design Analysis and Synthesis

10:30 a.m. to Noon

Tuesday, June 9, 1987

Chairman: Ulrich L. Rohde, Compact Software

- C-1** **Simple Analytical Modeling of GaAs MESFET Nonlinear Behavior** **103**
10:30 a.m. T. Kawai, and F.J. Rosenbaum
Washington University,
St. Louis, MO.
- C-2** **Large-Signal Modeling of GaAs Power FET Amplifiers** **107**
10:40 a.m. M.A. Khatibzadeh, R.J. Trew and I.J. Bahl*
Electrical and Computer Engineering Department
North Carolina State Univ.
Raleigh, NC
*ITT-GTC, Roanoke, VA
- C-3** **Optimum Design of Non Linear Power FET Amplifiers** **111**
10:50 a.m. C. Guo*, M. Camiade**, D. Rousset*, A. Cessey**, J. Obregon*,
and A. Bert**
*IRCOM Université de Limoges, France
**Thomson Composants DHM, Massy, France
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11:10 a.m. **MESFET Amplifier: Simulation and Experiment** **115**
G.W. Rhyne and M.B. Steer
Department of Electrical and Computer Engineering
North Carolina State University,
Raleigh, NC
- C-5** **The Spectral Balance: A General Method for Analysis of Nonlinear**
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M. Gayral, E. Ngoya, R. Quere, J. Rousset, J. Obregon
Université de Limoges, France
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11:50 a.m. I. Wolff
Dept. of Elect. Engr.
Duisburg University, FRG.
and H. Kapusta, Siemens AG, Munchen, FRG.

Session D

Gable 3, 4 Room: Microwave Filters and Multiplexers

10:30 a.m. to Noon

Tuesday, June 9, 1987

Chairman: R.V. Snyder, R.S. Microwave Company, Inc.

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M.C. Horton
MCH Associates
Thousand Oaks, CA | 129 |
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T. Nishikawa, K. Wakino, K. Tsunoda, Y. Ishikawa
Murata Manufacturing Co., Ltd.
Kyoto, Japan | 133 |
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Y. Kobayashi, and K. Kubo
Department of Electrical Engineering
Saitama University
Urawa, Saitama, Japan | 137 |
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K.A. Zaki and C. Chen
Electrical Engineering Department
University of Maryland
College Park, MD
A.E. Atia
Comsat Corporation,
950 L'Enfant Plaza S.W.
Washington, DC | 141 |
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R.R. Bonetti and A.E. Williams
Comsat Laboratories
Clarksburg, MD | 145 |
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C.I. Mobbs
Filtronic Components, Ltd.
Shipleigh, UK | 149 |

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Ziegfeld Room: Joint with Monolithics Symposium
– Low Noise Techniques

1:30 p.m to 3:00 p.m.

Tuesday, June 9, 1987

Chairman: V. Nair, Motorola, Inc.
Co-Chairman: S. Moghe, Pacific Monolithics

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C. Nishimoto, R. LaRue, S. Bandy, N. Day, J. Eckstein, C. Webb,
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Palo Alto, CA | 155 |
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Avantek, Inc.
Santa Clara, CA | 165 |
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P. Jean, V. Pauker, and P. Dautriche
Laboratoires D'Electronique Et De Physique Appliqué
Limeil-Brevannes, France | 169 |

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Gable 5, 6, 7 Room: Microwave Integrated Circuits

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Tuesday, June 9, 1987

Chairman: C. Buntschuh, Narda Microwave

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S. Fiedziuszko
Ford Aerospace and Communications Co.
Western Development Laboratories
Palo Alto, CA | 175 |
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E. Camargo, and F. Corra
Universidade De Sao Paulo, Brazil | 177 |
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H. Ogawa, T. Hirota, and A. Minagawa
NTT Electrical Communications Lab
Nippon Telegraph and Telephone Corp.
Yokosuka-Shi, Japan | 181 |
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S. Young and K.D. Stephan
Dept. of Electrical and Computer Engineering
University of Massachusetts
Amherst, MA | 185 |
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A.P.S. Khanna and R. Sooho
Avantek Inc.
Santa Clara, CA | 189 |
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E.C. Niehenke and P.A. Green
Westinghouse Defense and Electronics Center
Baltimore, MD | 193 |

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Gable 3, 4 Room: Couplers and Power Dividers

1:30 p.m. to 3:00 p.m.

Tuesday, June 9, 1987

Chairman: Peter LaTourette, Consultant

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Gerry Seck
Datron Systems, Inc.
Simi Valley, CA | 199 |
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R.Gupta, S. Anderson, and W. Getsinger
Comsat Laboratories
Clarksburg, MD | 203 |
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T. Anada and J. Hsu
Kanagawa University
Yokohama-shi, Japan | 207 |
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MIT Lincoln Laboratory
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K.C. Gupta
University of Colorado
Boulder, CO | 211 |
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Boiriet Technologies, Inc.
Carleton Place Ontario, Canada
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University of Victoria
Victoria, B.C., Canada | 215 |

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Gable 5, 6, 7 Room: Joint with Monolithics Symposium – MMIC Manufacturability

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Tuesday, June 9, 1987

Chairman: James Schellenberg, Hughes Aircraft Co.

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J.S. Pavio
Texas Instruments
Dallas, TX | 221 |
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Varian Associates
Santa Clara, CA | 225 |
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TRW Microwave and Millimeter Wave Technology Center
Redondo Beach, CA | 229 |
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A.R. Harvey, F.J. Cotton, R.M. Eaton and P.D. Cooper
Plessey Research
Caswell, England | 233 |

Session I

Gable 3, 4 Room: Biomedical Aspects of Microwaves

3:30 p.m. to 5:00 p.m.

Tuesday, June 9, 1987

Chairman: Arye Rosen, RCA David Sarnoff Research Center

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R.H. Johnson
Royal Military College of Science, Shrivenham, UK
A.W. Preece
Royal Infirmary, Bristol, UK
J.W. Hand
Hammersmith Hospital, London, UK
and J.R. James
Royal Military College, Shrivenham, UK
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J. Brose and G. Flachenecker
Institute of High Frequency Technique
Univ. of the Bundeswehr
Munich, FRG
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MIT
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X. Deming, L. Liping and J. Zhiyan
Department of Radio & Electronics
Shanghai University of Science & Technology
Shanghai, P.R. China
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David Sarnoff Research Center, Princeton, NJ
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Drexel University, Philadelphia, PA

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Tuesday, June 9, 1987

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Hughes Aircraft Company
Canoga Park, CA
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Council for Scientific and Industrial Research
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Dept. of Information Electronics
Tsinghua University
Beijing, China
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San Jose, CA
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Rensselaer Polytechnic Inst.
Troy, NY

*Manuscript not available at the time of printing

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National Research Institute of Radar
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Nanjing Research Institute of Electronic Technology
China
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Department of Electrical and Computer Engineering
University of Pretoria
South Africa

Session K

Ziegfeld Room: MMW Technology and Applications

8:30 a.m. to 10:00 a.m.

Wednesday, June 10, 1987

Chairman: J. Horton, TRW

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Narrowband Millimeter-Wave Bandpass Filters with Low Radiation
Losses** **425**
P.K. Ikalainen and G.L. Matthaei
Department of Electrical and Computer Engineering
University of California
Santa Barbara, CA
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L.D. Cohen, and E. Sard
Eaton Corp, AIL Division
Melville, NY
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H. Barth
AEG Aktiengesellschaft
Ulm, W. Germany
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D.N. Black and J.C. Wiltse
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Georgia Institute of Technology
Atlanta, GA
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J.M. Schellenberg, M.V. Maher, S.K. Wang, K.G. Wang and K.K. Yu
Hughes Aircraft Company
Microwave Products Division
Torrance, CA

Session L

Gable 5, 6, 7 Room: Microwave Measurements

8:30 a.m. to 10:00 a.m.

Wednesday, June 10, 1987

Chairman: H. George Oltman, Jr., Tecom Industries

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J.F. White and S.J. Parisi
M/A-COM, Inc.
Burlington, MA | 445 |
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M. Roos and V. Sotoudeh
EIP Microwave, Inc.
San Jose, CA | 449 |
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Microwave Technology Division
Hewlett-Packard Co., Santa Rosa, CA | 453 |
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J.A. Weiss
Department of Physics
Worcester Polytechnic Institute, MA
and D.A. Hawks
ASIC Package Engineering
Digital Equipment Corp., Hudson, MD | 457 |
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S.O. Nelson
U.S. Dept. of Agriculture
Athens, Georgia | 461 |
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J. Low, M. Finzel, J. Asmussen* and M.C. Hawley
Dept. of Chemical Engineering
*Dept. of Electrical Engineering & System Science,
Michigan State University, East Lansing, MI | 465 |

Session M

Gable 3, 4 Room: Communications Systems

8:30 a.m. to 10:00 a.m.

Wednesday, June 10, 1987

Chairman: Peter G. Petrelis, TRW

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G. Fujikawa and R. Kerczewski
NASA Lewis Research Center
Cleveland, OH | 471 |
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8:50 a.m. | Phase Transients in Digital Radio Local Oscillators
M. Znojkwicz and B. Vassilakis
Northern Telecom Canada LTD.
Montreal, Canada | 475 |
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P. Bura, D. Geleman, P. Ntake
Northern Telecom
St. Laurent, Canada | 479 |
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L. Duque, S. Jarvis, G. Gatti*, and R. Dion
Spar Aerospace Ltd.
Montreal, Canada
*European Space Agency | 483 |
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H. Kikuchi, S. Konaka, and M. Umehira
NTT Electrical Communications Laboratories
Kanagawa, Japan | 487 |

Session N

Ziegfeld Room: – Focused Session –

Advances in Millimeter Wave Systems (60-230 GHz)

10:30 a.m. to Noon

Wednesday, June 10, 1987

Chairman: James C. Wiltse, Georgia Tech Research Institute

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10:30 a.m. | Recent Advances in Millimeter Wave Instrumentation for
Radio Astronomy
J.M. Payne
National Radio Astronomy Observatory
Tucson, AZ | 493 |
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Seeker Front Ends
T.T. Fong
TRW
Redondo Beach, CA | 497 |
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(HIPCOR-95)
J.C. Butterworth
Georgia Tech Research Institute
Atlanta, GA | 499 |
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R.J. Temkin
Plasma Fusion Center, MIT
Cambridge, MA | 503 |

Session P

Gable 3, 4 Room: Radar Systems

10:30 a.m. to Noon

Wednesday, June 10, 1987

Chairman: Kiyo Tomiyasu, General Electric Co.

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Airport Beacon System Sensor
T.M. Nelson, M.J. Reinhart, K.J. Yoo, D.A. Poltorak and R.K. Palmer
Westinghouse Electric Corp.
Baltimore, MD | 531 |
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C.E. Burnett
Marconi Electronic Devices Ltd.
Lincoln, England | 535 |
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'Frequency Set-On' Oscillators
J.D. Rhodes
Filtronic Components Ltd.
Charlestown, UK | 539 |
| P-4
11:30 a.m. | Noise in Pulsed Microwave Systems
C. Wong, E. Caramanis, A. Skantzaris, J. Bender and R. Campbell
Raytheon Co.
Bedford, MA | 543 |

Session Q

Garland Ballroom: Open Forum II

1:30 to 3:30 p.m.

Wednesday, June 10, 1987

- Q-1** **Multioctave Multithrow Active Switches** **549**
D.L. Dunn, P.G. Asher, and C.D. Chang
Hughes Aircraft Company
Torrance, CA
- Q-2** **A Comparative Study of TEGFET and MESFET Large Signal Characteristics and Saturation Mechanisms** **553**
M. Weiss
Thomson Semiconductors, Orsay, France
and D. Pavlidis
University of Michigan, Ann Arbor, MI
- Q-3** **Comparative Study of Phase Noise in HEMT and MESFET Microwave Oscillators** **557**
M. Pouysegur
LAAS du CNRS, Toulouse, France
J. Graffeuil, J.F. Sautereau
Université Paul Sabatier, Toulouse, France
and J.P. Fortea
Centre Nat. D'Études Spatiales, Toulouse, France
- Q-4** **A GaAs Monolithic 6 GHz Low-Noise Amplifier for Satellite Receivers** **561**
R. Mott
COMSAT Laboratories
Clarksburg, MD
- Q-5** **Miniature Gain Block for Satellite Communication Transceivers** **565**
A. Fathy, R. Brown and E. Belohoubek
RCA Laboratories
Princeton, NJ
- Q-6** **A GaAs Microwave MESFET with Extremely Low Distortion** **569**
G.G. Zhou, T. Curtis and R. Chen
Gould Inc. Microwave Products Division
San Jose, CA
- Q-7** **The Deformable-Channel Model-A New Approach to High-Frequency MESFET Modeling** **573**
F. Crowne, A. Eskandarian, H.B. Sequeira and R. Jahkete
Martin Marieta Laboratories/Gamma Monolithics
Baltimore, MD

Q-8	Load-Line Analysis in the Frequency Domain with Distributed Amplifier Design Examples M.L. Salib, D.E. Dawson, and H.K. Hahn Westinghouse Electric Corp. Baltimore, MD	575
Q-9	Fast Settling, Low Noise Ku Band Fundamental Bipolar VCO A.P.S. Khanna Avantek Inc. Santa Clara, CA	579
Q-10	Long Term Stability of DROs Compared to Crystal Oscillators K.R. Varian Rockwell International Dallas, TX	583
Q-11	Low Phase Noise X/KU-Band VCO D.A. Boyd Eaton Corp., Microwave Products Division Sunnyvale, CA	587
Q-12	Microwave Resistance of Gallium Arsenide and Silicon P-I-N Diodes R. Caverly Southeastern Mass. University N. Dartmouth, MA and G. Hiller M/A-COM Semiconductor Products Burlington, MA	591
Q-13	W Band Crossbar Mixers Integrated Entirely on a Single-Sided Substrate Yielding 15 GHz Instantaneous Bandwidth S. Low COM DEV Ltd. Cambridge, Canada	595
Q-14	Diode Phase Shifter and Model in Waveguide J.A. Lester and C.M. Jackson TRW Redondo Beach, CA and K. Chang Texas A & M University, TX	599

Q-15	Wide-Band True Time Delay Phase Shifter Device P.R. Herczfeld, A. Daryoush Drexel University, Philadelphia, PA M. Kieli Thomas & Betts, Raritan, NJ S. Siegel RCA, David Sarnoff Lab, Princeton, NJ and R. Soref RACD/ESO Hanscom AFB, MA	603
Q-16	A Novel Whiskerless Schottky Diode for Millimeter and Submillimeter Wave Application W.L. Bishop, K. McKinney, R.J. Mattauch, T.W. Crowe, and G. Green Department of Electrical Engineering University of Virginia, Charlottesville, VA	607
Q-17	Filled Image Guide for Millimeter-Wave Circuits M.Q. Shi and D.H. Jiang Peking University Beijing, People's Republic of China	611
Q-18	A Tunable Grating Impedance Transformer J.D. Xu Northwestern Polytechnical University Xian Shaanxi, China	*
Q-19	A Novel Technique for Evaluation and Integration of Connectorless (Drop-In) Microwave Components D. Herstein General Microwave Corporation Amityville, NY	613
Q-20	Coupling Between Hybrid Mode Dielectric Resonators K.A. Zaki and C.M. Chen Electrical Engineering Department University of Maryland College Park, MD	617
Q-21	Exact Calculation of Scattering Parameters of the Coplanar – Slot Transition in a Unilateral Finline Technology O. Picon, J.P. Lefevre, V.F. Hanna CNET, Issy-Les-Moulineaux, France and J. Citerne Laboratoires Structures Rayonnantes, Rennes Cedex, France	621

*Manuscript not available at the time of printing

Q-22	Analysis of VLSI Interconnect Structures L. Carin, Q. Xu, and K. J. Webb University of Maryland College Park, MD and J.A. McClintock Martin Marietta Labs Baltimore, MD	625
Q-23	Towards a Unified Efficient Algorithm for Characterizing The Planar Periodic Waveguides K. Wu and P. Saguet Laboratoire D'Électromagnétisme Et Optique Guidée E.N.S.R.G. Grenoble, France	629
Q-24	Centering and Tolerancing the Components of Microwave Amplifiers A. MacFarland, J. Purviance Department of Electrical Engineering University of Idaho Moscow, Idaho and D. Loeschner, K. Diegert, and T. Ferguson Sandia National Laboratories Albuquerque, NM	633
Q-25	Analysis of Discontinuities in Optical Waveguides J.B. Davies and B.M.A. Rahman University College London, UK	637
Q-26	Optical Crosstalk Due to Electrical Coupling in High Speed LINb03 P. Perlmutter, J.E. Baran and Y Silberberg Bell Communications Research Red Bank, NJ	641
Q-27	Optoelectronic Generation and Sensing of Millimeter Waves A.P. DeFonzo and C. Lutz University of Massachusetts Amherst, MA	645
Q-28	Generation of Kilowatt/Kilovolt Broadband Microwave Bursts with a Single Picosecond Photoconductive Switch H.A. Sayadian, M.G. Li and C.H. Lee University of Maryland College Park, MD	649

- Q-29** **Large Signal Modulation of Semiconductor Lasers with Optical Feedback for Millimeter Wave Applications** **653**
V.M. Contarino
Naval Air Development Center
Warminster, PA
and A.S. Dayoush and P.R. Herczfeld
Drexel University
Philadelphia, PA
- Q-30** **Optically Controlled Millimeter Wave Phase Shifter in a Metallic Waveguide** **657**
G. Hadjicostas and J. Butler
Southern Methodist University
Dallas, TX
and M. Scott
LTV Aerospace & Def. Co.
Dallas, TX
- Q-31** **A New Generalised Approach to the Design of Microwave Oscillators** **661**
Y. Xuan and C.M. Snowden
Department of Electrical & Electronic Engineering
University of Leeds
Leeds, UK
- Q-32** **A Refractory Self-Aligned Gate Process for Monolithically Combined Microwave and Digital GaAs ICs** **665**
A. Geissberger, R. Sadler, E. Griffin, H. Singh,
I. Bahl and M. Drinkwine
ITT Gallium Arsenide Technology Center
Roanoke, VA
- Q-33** **Analysis of Multiple-Step Radial-Resonator Waveguide Diode Mounts with Application to IMPATT Oscillator Circuits** **669**
B.D. Bates
Department of Electrical and Electronic Engineering
University of Melbourne
Australia
- Q-34** **Absorbed Power Distribution in Heart Lung System Due to Microwave Irradiation at 750 MHz** **673**
J. Behari
School of Environmental Sciences
Jawaharlal Nehru University
New Delhi, India

- Q-35 Dielectric-Resonator-Stabilized Second Harmonic Ka-Band Microstrip Gunn Oscillator** **677**
S. Zhong-Liang and C. Ning
Department of Radio Engineering
Nanjing Institute of Technology
Nanjing, China
- Q-36 Edge Corrections for Microstrip Planar Analysis Models** **681**
H.A. Burger
Goodyear Aerospace Corporation
Litchfield Park, AZ
- Q-37 Characterization Method and Simple Design Formulas of MCS Lines Proposed for MMICs** **685**
E. Yamashita, K.R. Li, E. Kaneko, and Y. Suzuki
University of Electro-Communications
Tokyo, Japan
- Q-38 Global Stability Analysis of Microwave Circuits by a Frequency-Domain Approach** **689**
V. Rizzoli
Department Di Electronica
University of Bologna
Bologna, Italy
A. Neri
Fondazione Ugo Bordoni
Bologna, Italy
- Q-39 Analysis Equations for Shielded Suspended Substrate Microstrip Line and Broadside-Coupled Stripline** **693**
Y. Shu, X. Qi, Y. Wang
Department of Radio Engineering
Nanjing Institute of Technology
Nanjing, China
- Q-40 The Effectiveness of Four Direct Search Optimization Algorithms** **697**
R.W. Rhea
Scientific Atlanta, Inc.
Atlanta, GA
- Q-41 Computer Aided Design Models for Unilateral Finline with Finite Metallization Thickness and Arbitrarily Located Slot Widths** **703**
P. Pramanick, R.R. Mansour
COM DEV Ltd.
Cambridge, Canada
and R.H. MacPhie
University of Waterloo
Ontario, Canada

- Q-42** **Puff, an Interactive Microwave Computer Aided Design Program for Personal Computers** **707**
R.C. Compton, W.L. Williams, and D.B. Rutledge
Division of Engineering and Applied Science
California Institute of Technology
Pasadena, CA
- Q-43** **An Automatic Decomposition Technique for Device Modeling and Large Circuit Design** **709**
J.W. Bandler and Q.J. Zhang
Electrical Engineering Department
McMaster University
Hamilton, Canada
- Q-44** **Modeling the Dispersion in a Suspended Microstripline** **713**
R.S. Tomar
Bolriet Technologies, Inc.
Carleton Place, Ontario, Canada
and P. Bhartia
Department of National Defense
Ottawa, Ontario, Canada
- Q-45** **An Almost-Periodic Fourier Transform for Use with Harmonic Balance** **717**
K.S. Kundert, G. Sorkin and A. Sangiovanni-Vincentelli
University of California
Berkeley, CA
- Q-46** **Generalized Analysis of E-Plane Septa Discontinuities** **721**
A. Rong, S. Li
Nanjing Institute of Technology
Nanjing, China

Session R

Gable 5, 6, 7 Room: Guided Waves

1:30 p.m. to 3:00 p.m.

Wednesday, June 10, 1987

Chairman: Prof. Jeffrey B. Knorr, Naval Postgraduate School

- R-1** **Simple Analytic Formulas for Dielectric Waveguides** **727**
1:30 p.m. S.T. Peng
New York Institute of Technology
Old Westbury, NY
S.L. Wang
University of New Haven
West Haven, CT
F.K. Schwering
U.S. Army CECOM
Ft. Monmouth, NJ
- R-2** **Guidance and Leakage Properties of Offset Groove Guide** **731**
1:50 p.m. H. Shigesawa, M. Tsuji
Doshisha University
Koyoto, Japan
A.A. Oliner
Polytechnic University
Brooklyn, NY
P. Lampariello, F. Frezza
University of Rome "La Sapienza"
Rome, Italy
- R-3** **Analysis and Design of Microslab™ Waveguide** **735**
2:10 p.m. B. Young and T. Itoh
University of Texas
Austin, TX
- R-4** **Microstrip Circuit Elements on Cylindrical Substrates** **739**
2:30 p.m. A. Nakatani
Phraxos Research and Development Inc.
Santa Monica, CA
and N.G. Alexopoulos
University of California
Los Angeles, CA
- R-5** **Analysis of Double-Layered Finlines Containing a**
2:50 p.m. **Magnetized Ferrite** **743**
M. Geshiro
On Leave From Ehime University,
Ehime, Japan
and T. Itoh
University of Texas
Austin, TX

Session S

Ziegfeld Room: – Focused Session –

Advances in Millimeter Wave Technology (60-230 GHz)

1:30 p.m. to 3:00 p.m.

Wednesday, June 10, 1987

Chairman: James C. Wiltse, Georgia Tech Research Institute

S-1 (Invited) 1:30 p.m.	Millimeter Wave Material Properties and Measurements G.J. Simonis U.S. Army Harry Diamond Laboratories Adelphi, MD	747
S-2 (Invited) 1:50 p.m.	Advances in HEMT Technology and Applications P.M. Smith, P.C. Chao, K.H.G. Duh, L.F. Lester B.R. Lee and J.M. Ballingall General Electric Co. Syracuse, NY	749
S-3 (Invited) 2:10 p.m.	Imaging Antenna Arrays D. Rutledge California Institute of Technology Pasadena, CA	*
S-4 (Invited) 2:30 p.m.	GaAs Schottky Barrier Diodes for High Sensitivity Millimeter and Submillimeter Wavelength Receivers T.W. Crowe and R.J. Mattauch University of Virginia Charlottesville, VA	753

Session T

Ziefeld Room: Invited European Session

3:30 p.m. to 5:00 p.m.

Wednesday, June 10, 1987

Chairman: R. Sparks, Raytheon

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|--|--|------------|
| T-1 (Invited)
3:30 p.m. | Detection of Millimeter and Submillimeter Waves
E. Kollberg
Chalmers University of Technology
Gothenburg, Sweden | 759 |
| T-2 (Invited)
4:00 p.m. | State-of-the-Art of MMIC Technology and Design in West Germany
E. Pettenpaul
Siemens AG
Munich, West Germany | 763 |
| T-3 (Invited)
4:30 p.m. | Modeling of New Microwave Devices
G. Salmer
Université de Lille
France | 767 |

Session U

Gable 5, 6, 7 Room: Waveguide Discontinuity Structures

3:30 p.m. to 5:00 p.m.

Wednesday, June 10, 1987

Chairman: James W. Mink, U.S. Army Research Office

- U-1**
3:30 p.m. **A Dynamic Model for Microstrip – Slotline Transition
and Related Structures** **773**
H.-Y. Yang and N.G. Alexopoulos
Electrical Engineering Department
University of California
Los Angeles, CA
- U-2**
3:50 p.m. **Characterization of Stripline Crossing by Transverse
Resonance Analysis** **777**
T. Uwano
Matsushita Electric Co.
Osaka, Japan
R. Sorrentino
University of Rome Tor Vergata
Roma, Italy
and T. Itoh
University of Texas
Austin, TX
- U-3**
4:10 p.m. **An Improved Multimode Small Aperture/Obstacle Theory** **781**
M. Guglielmi and A.A. Oliner
Polytechnic University
Brooklyn, NY
- U-4**
4:30 p.m. **An Accurate Analysis of Discontinuities in Dielectric Rectangular
Waveguide and its Application to Grating Filters** **785**
M. Tsuji and H. Shigesawa
Department of Electronics
Doshisha University
Kyoto, Japan
- U-5**
4:50 p.m. **Variational Bound Analysis of a Discontinuity in Nonradiative
Dielectric Waveguide** **789**
J.C. Olivier and J.A.G. Malherbe
University of Pretoria
South Africa

Session V

Gable 3, 4 Room: Microwave Acoustics: Developments & Applications
3:30 p.m. to 5:00 p.m. Wednesday, June 10, 1987

Chairman: Ted Lukaszek, U.S. Army Labcom

- | | | |
|--------------------------------|---|-----|
| V-1
3:30 p.m. | Applications of Custom SAW Devices
Ronald C. Rosenfeld
Sawtek Inc.
Orlando, FL | * |
| V-2
3:50 p.m. | Evolution of SAW Technology from Discrete Devices to Functional RF Building Blocks
H.G. Vollers and D. L. Ash
RF Monolithics
Dallas TX | 793 |
| V-3
4:10 p.m. | Miniature SAW Antenna Duplexer for Portable Telephone
M. Hikita, Y. Ishica, T. Tabuchi and H. Kojima
Central Research Laboratory
Hitachi, Ltd.
Tokyo, Japan
and K. Kurosawa
Hitachi Toukai Works
Katsuta, Japan | 797 |
| V-4
4:20 p.m. | Design and Evaluation of UHF Monolithic Film Resonator-Stabilized Oscillators and Bandpass Filters
M.M. Driscoll, R.A. Moore, J.F. Rosenbaum
Westinghouse Defense and Electronics Center
Baltimore,MD
and S.V. Krishnaswami, and J.R. Szedon
Westinghouse Research and Development Center
Pittsburgh, PA | 801 |
| V-5
4:40 p.m. | Performance of Acoustic Charge Transport Chirp Filters
F. Fiegel, R. Martin, and F. Guedin
Electronic Decisions, Inc.
Urbana, IL | 805 |

*Manuscript not available at the time of printing

Session W

Gable 3, 4 Room: – Focused Session –

Optical Techniques for Microwave Applications I

8:30 a.m. to 10:00 a.m.

Thursday, June 11, 1987

Chairman: Tatsuo Itoh, University of Texas, Austin

- | | | |
|------------------------------------|---|------------|
| W-1 (Invited)
8:30 a.m. | Optical Generation and Control of Microwaves and Millimeter-Waves
C.H. Lee
Department of Electrical Engineering
University of Maryland
College Park, MD | 811 |
| W-2
9:00 a.m. | Microwave Performance of an Optically Controlled AlGaAs/GaAs High Electron Mobility Transistor and GaAs MESFET
R.N. Simons
NRC-NASA Research Associate
Cleveland, OH
and K.B. Bhasin
NASA Lewis Research Center
Cleveland, OH | 815 |
| W-3
9:20 a.m. | A High-Speed Phase Shifter Based on Optical Injection
L.R. Brothers and C.H. Cox, III
MIT Lincoln Laboratory
Lexington, MA | 819 |
| W-4
9:40 a.m. | Phase and Frequency Coherency of Multiple Optically Synchronized 20 GHz FET Oscillators For Satellite Communications
A.S. Daryoush, P.R. Herczfeld, R. Glatz
Department of Electrical and Computer Engineering
Drexel University, Philadelphia, PA
and A.P.S. Khanna
Avantek, Santa Clara, CA | 823 |

Session X

Ziegfeld Room: FET Amplifiers

8:30 a.m. to 10:00 a.m.

Thursday, June 11, 1987

Chairman: Eliot D. Cohen, Defense Logistics Agency

- | | | |
|-------------------------|--|------------|
| X-1
8:30 a.m. | Design and Performance of a New Multi Octave High-Gain Amplifier
K.B. Niclas, R.R. Pereira, A.J. Graven and A.P. Chang
Watkins-Johnson Company
Palo Alto, CA | 829 |
| X-2
8:50 a.m. | A High Performance, Quasi-Monolithic 2-18GHz Distributed GaAs FET Amplifier
A. Cappello, T. Alexander, J. Calviello, D. Ward, P. Bié and R. Pomian
Eaton Corporation/AIL Division
Melville, NY | 833 |
| X-3
9:00 a.m. | Operating Characteristics of 2-8 GHz GaAs MESFET Amplifiers at Elevated Case Temperatures to 200 Degrees Centigrade
E.J. Crescenzi, Jr., J.A. Thompson, T.R. Kritzer and M.E. Kretschmar
Watkins-Johnson Co.
Palo Alto, CA | 837 |
| X-4
9:20 a.m. | A 6-18 GHz MMIC Power Amplifier Module Designed for Automated Assembly Fabrication*
C.A. Sapashe, D.L. Green, C.D. Palmer, and J.S. Pavio
Texas Instruments
Dallas, TX | 841 |
| X-5
9:30 a.m. | A 6 Watt Power GaAs FET for 14.0-14.5 GHz Band
Y. Kadowaki, S. Igi, M. Wataze, T. Sonoda, K. Hayashi, M. Yamanouchi, S. Takamiya and S. Mitsui
Mitsubishi Electric Corporation
Hoyogo, Japan | 845 |
| X-6
9:40 a.m. | K- and Ka-Band High Efficiency Amplifier Modules Using GaAs Power FETs
D. Bechtle, J. Klatskin, G. Taylor, M. Eron, S.G. Liu, R. Camisa and H. Dudley
David Sarnoff Research Center
Princeton, NJ | 849 |

*Public dissemination disapproved by sponsor

Session Y

Gable 5, 6, 7 Room: Solid State Devices/Circuits I

8:30 a.m. to 10:00 a.m.

Thursday, June 11, 1987

Chairman: Michael Dydyk, Motorola

- | | | |
|--------------------------------|--|------------|
| Y-1
8:30 a.m. | Silicon Bipolar MMIC for Frequency-Conversion Application up to 20 GHz
L. Kipnas
Avantek, Inc.
Santa Clara, CA | 855 |
| Y-2
8:50 a.m. | Frequency Stability of L-Band Two-Port Dielectric Resonator Oscillators
M. Loboda, T.E. Parker, and G.K. Montress
Raytheon Research Division
Lexington, MA | 859 |
| Y-3
9:10 a.m. | Solid State MM-Wave Oscillators with Large Tuning Range
K. Jacobs, and B. Vowinkel
University of Cologne
West Germany | 863 |
| Y-4
9:20 a.m. | Varactor-Tuned Microstrip Ring Resonators
K. Chang, S. Martin, and F. Wang
Department of Electrical Engineering
Texas A & M University
College Station, TX | 867 |
| Y-5
9:40 a.m. | A Multi-Diode Cavity Power Combiner Using State-of-the-Art Pulsed Gunn Diodes
B.E. Sigmon
Motorola Government Electronics Group
Tempe, AZ
and M. Ayyagari
MA/COM Semiconductor
Burlington, MA | 871 |

Session Z

Gable 3, 4 Room: – Focused Session –

Optical Techniques for Microwave Applications II

10:30 a.m. to Noon

Thursday, June 11, 1987

Chairman: N.R. Dietrich, AT&T Labs

- | | | |
|-------------------------------------|--|------------|
| Z-1 (Invited)
10:30 a.m. | Microwave Measurements of GaAs Integrated Circuits Using Electrooptic Sampling
K.J. Weingarten, R. Majidy-Aky, M.J.W. Rodwell, D.M. Bloom and B.A. Auld
Stanford University
Stanford, CA | 877 |
| Z-2
11:00 a.m. | Picosecond Reflectometry Technique for On-Chip Characterization of Millimeter-Wave Semiconductor Devices
C. Rauscher
Naval Research Laboratory
Washington, DC | 881 |
| Z-3
11:20 a.m. | Direct Fiber Optic Transmission of a Wideband Multi-Carrier Microwave Signal Spectrum to and from Satellite Earth Station Antennas
J.W. Carlin, J.E. Bowers, A.C. Chipaloski and S. Boodaghians
AT&T-Bell Laboratories
Holmdel, NJ | 885 |
| Z-4
11:40 a.m. | Optical Feedback on Linearity Performance of 1.3 μm DFB and Multimode Lasers Under Deep Microwave Modulation
W.I. Way and M.M. Choy
Bell Communications Research
Red Bank, NJ | 889 |

Session AA

Ziegfeld Room: Non-Linear FET Applications

10:30 a.m. to Noon

Thursday, June 11, 1987

Chairman: E.C. Niehenke, Westinghouse Electric Corp.

- | | | |
|----------------------------------|--|------------|
| AA-1
10:30 a.m. | A GaAs MESFET Balanced Mixer with Very Low Intermodulation
Stephen A. Maas
The Aerospace Corp.
Los Angeles, CA | 895 |
| AA-2
10:50 a.m. | A Monolithic Double Balanced Single Sideband Modulator
S.D. Thompson and A.M. Pavio
Texas Instruments, Inc.
Dallas, TX | 899 |
| AA-3
11:10 a.m. | Passive GaAs FET Switch Models and their Application in Phase Shifters
L.C. Upadhyayula, R.L. Camisa, G. Taylor, S.N. Subbarao
and S.G. Liu
RCA Laboratories
Princeton, NJ | 903 |
| AA-4
11:20 a.m. | A Non-Linear Design and Optimization Procedure for GaAs MESFET Oscillators
T.J. Brazil and J.O. Scanlan
Department of Electrical Engineering
University College
Dublin, Ireland | 907 |
| AA-5
11:40 a.m. | High Performance GaAs C-Band and Ku-Band MMIC Oscillators
S. Moghe and T. Holden
Pacific Monolithics, Inc.
Sunnyvale, CA | 911 |

Session CC

Gable 3, 4 Room: Phased and Active Array Techniques

1:30 p.m. to 3:00 p.m.

Thursday, June 11, 1987

Chairman: Eugene H. Gregory, Hughes Aircraft Co.

- | | | |
|---------------------------------|---|------------|
| CC-1
1:30 p.m. | A 2 Watt GaAs TX/RX Module with Integral Control Circuitry,
For S-Band Phased Array Radars | 933 |
| | C.R. Green, A.A. Lane, P.N. Tombs, R. Shukla, P.D. Cooper
J.R. Suffolk, and J.A. Sparrow
Plessey Research Caswell Ltd.
Caswell, UK | |
| CC-2
1:50 p.m. | A 35 GHz Electronically Steered Line Array | 937 |
| | R.J. Lang and B.J. Edward
General Electric Company
Syracuse, NY | |
| CC-3
2:10 p.m. | An Ultraminiature 5-10 GHz, 2 Watt Transmit Module for Active
Aperture Application | 941 |
| | J. Pierro and R. Clouse
Eaton Corp./AIL Division
Melville, NY | |
| CC-4
2:30 p.m. | Microstrip FED Planar Frequency Multiplying Space Combiner | 945 |
| | S. Nam, T. Uwano, and T. Itoh
Department of Electrical and Computer Engineering
University of Texas
Austin, TX | |
| CC-5
2:40 p.m. | Low Cost Cartop Phased Array Steering | 949 |
| | G. Schaffner
Teledyne Ryan Electronics
San Diego, CA | |

Session DD

Ziegfeld Room: HEMT/MESFET Applications

1:30 p.m. to 3:00 p.m.

Thursday, June 11, 1987

Chairman: B.D. Geller, Comsat Corporation

- DD-1** **Bias-Dependent Microwave Characteristics of an Atomic Planar-Doped AlGaAs/InGaAs/GaAs Double Hetrojunction MODFET** *
- 1:30 p.m.** Y.K. Chen, D.C. Radulescu, G.W. Wang, A.N. Lepore, P.J. Tasker and L.F. Eastman
School of Electrical Engineering
Cornell University
Ithaca, NY
- DD-2** **FETs and HEMTs at Cryogenic Temperatures – Their Properties and Use in Low-Noise Amplifiers** **955**
- 1:50 p.m.** M.W. Pospieszalski and S. Weinreb
National Radio Astronomy Observatory
Charlottesville, VA
- DD-3** **Reliability of Low-Noise Microwave HEMT Using by MOCVD** *
- 2:10 p.m.** K. Tanaka, H. Takakuwa, K. Togashi, Y. Kato and S. Watanabe
Sony Corp.
Kanagawa, Japan
- DD-4** **Predicting Long Term Frequency Drift in FET Oscillators Using Device Modeling** **959**
- 2:20 p.m.** K.K. Agarwal and C. Ho
Telecommunication Division
Rockwell International Corp.
Dallas, TX
- DD-5** **Harmonic Reaction Amplifier – A Novel High-Efficiency and High-Power Microwave Amplifier** **963**
- 2:40 p.m.** S. Nishiki and T. Nojima
NTT Electrical Communications Laboratories
Take Yokosuka-Shi, Kanagawa-Ken, Japan

*Manuscript not available at the time of printing

Session EE

Gable 5, 6, 7 Room: Solid State Devices/Circuits III

1:30 p.m. to 3:00 p.m.

Thursday, June 11, 1987

Chairman: Robert L. Eisenhart, Hughes Aircraft Co.

- EE-1** **AlGaAs/GaAs Heterojunction Bipolar Transistors with**
1:30 p.m. **4W/mm Power Density at X Band** **969**
B. Bayraktaroglu, N. Camilieri, H.D. Shih, and H.G. Tserng
Texas Instruments
Dallas, TX
- EE-2** **Millimeter Wave Heterojunction MITATT Diodes** **973**
1:50 p.m. N.S. Dogan, J.R. East
Department of Electrical Engineering
Washington State University
Pullman, WA
M.E. Elta and G.I. Haddad
The University of Michigan
Ann Arbor, MI
- EE-3** **Improved Performance of Fundamental and Second Harmonic MMW**
2:10 p.m. **Oscillators Through Active Device Doping Concentration**
Contouring **977**
J. Ondria
Marconi Electronic Devices Ltd
Lincoln, England
and R.L. Ross
U.S. Army Electronic Technology and Devices Laboratory
Fort Monmouth, NJ
- EE-4** **W-Band Microstrip Oscillator Using InP**
2:30 p.m. **Gunn Diode** **981**
D.R. Singh
Defense Systems Division
Honeywell Inc.
Minnetonka, MN

Session FF

Gable 3, 4 Room: Microwave Ferrites

3:30 p.m. to 5:00 p.m.

Thursday, June 11, 1987

Chairman: W.E. Hord, Microwave Applications Group

- FF-1** **A New Type of Fast Switching Dual-Mode Ferrite Phase Shifter** **985**
3:30 p.m. W.E. Hord, C.R. Boyd, Jr. and D. Diaz
Microwave Applications Group
Santa Maria, CA
- FF-2** **Impact of Dielectric Loss Tangent on the Performance of**
3:50 p.m. **Millimeter Wave Ferrite Circulators** **989**
G.R. Harrison, S.B. Thompson, J.T. Vaughn
Electromagnetic Sciences, Inc.
Norcross, GA
and G.P. Rodrigue
School of Electrical Engineering
Georgia Institute of Technology
Atlanta, GA
- FF-3** **Full Wave Analysis of Slot Line and Coplanar Waveguide on a**
4:00 p.m. **Magnetic Substrate** **993**
E. El-Sharawy and R.W. Jackson
University of Massachusetts
Amherst, MA
- FF-4** **Magnetostatic Waves in a Normally Magnetized Waveguide Structure** **997**
4:10 p.m. M. Radmanesh
GMI Engineering & Management Institute
Flint, MI
and C.M. Chu and G.I. Haddad
University of Michigan
Ann Arbor, MI
- FF-5** **Energy Storage Effect in MSSW Metal-Finger Reflectors** **1001**
4:20 p.m. T.S. Cheng
Bell Communications Research
Red Bank, NJ
and J.P. Parekh and H.S. Tuan
Department of Electrical Engineering
State University of New York
Stony Brook, NY

Session GG

Gable 5, 6, 7 Room: HEMT Amplifiers and Devices

3:30 p.m. to 5:00 p.m.

Thursday, June 11, 1987

Chairman: Bert Berson, Berson & Associates

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| GG-1
3:30 p.m. | HEMT Low-Noise Amplifier for Ka-Band
M.A.G. Upton, P.M. Smith and P.C. Chao
General Electric Co.
Syracuse, NY | 1007 |
| GG-2
3:50 p.m. | Broadband HEMT Amplifier for 26.5-40 GHz
K. Shibata, B. Abe, S. Hori and K. Kamei
Toshiba Corporation
Kawasaki, Japan | 1011 |
| GG-3
4:10 p.m. | A Four Stage V-Band MOCVD HEMT Amplifier
W. Yau, E.T. Watkins, S.K. Wang, K. Wang and B. Klatskin
Hughes Aircraft Company
Torrance, CA | 1015 |
| GG-4
4:30 p.m. | Super Low-Noise HEMTs with a T-Shaped Gate Structure
S. Asai, K. Joshin, Y. Hirachi and M. Abe
Fujitsu Laboratories Ltd.
Atsugi, Japan | 1019 |
| GG-5
4:40 p.m. | Reliability of Super Low Noise HEMTs
K. Hayashi, T. Sonoda, T. Yamaguchi, K. Nagahama, S. Takamiya,
S. Mitsui, and M. Yamanouchi
Mitsubishi Electric Corp.
Itami, Japan | 1023 |